

CLAIMS

1. A machine adapted to assemble a dental product, the dental product having a body, first and second gears, and a tool, the machine comprising:
 - feeders for automatically supplying the component parts;
 - contiguous assembly stations coupled to the feeders for receiving the component parts and for performing assembly steps of the dental product, the assembly stations comprising a body station for receiving and holding the body of the product, at least two gear stations for introducing the first and second gears of the dental product into the body, and a tool station for connecting the tool to the second gear of the dental product, wherein the machine produces assembled angles.
2. The machine of Claim 1 further comprising a lubricating station for applying lubricant to the gears of the dental product.
3. The machine of Claim 1 further comprising a first conveyor for automatically moving assembled angles to a bagging unit, the bagging unit automatically bagging the assembled angles.
4. The machine of Claim 3 further comprising a batch-counting unit for automatically counting a batch of assembled and bagged dental products and placing the batch in a container, and a second conveyor for moving assembled and bagged dental products from the bagging unit to the batch-counting unit.
5. The machine of Claim 4 further comprising a batch conveyor system comprising a first accumulating conveyor for supplying containers to the batch-counting unit and a second accumulating conveyor for moving a container with the batch to an unloading station.
6. The machine of Claim 5 further comprising a carton-sealing unit for sealing the container, the carton-sealing unit being located on the second accumulating conveyor and prior to the unloading station.
7. A machine for automating the assembly of a dental product, the dental product comprising a body, first and second gears, and a tool, the machine comprising:
 - a moveable table having a plurality of fixtures for holding the dental product during assembly;
 - a body feeder for supplying the body of the dental product;
 - a body transfer mechanism for moving the body from the body feeder to the fixtures;
 - a first gear feeder for supplying the first gear of the dental product;
 - a first gear transfer mechanism for moving the first gear from the first gear feeder and locating it in the body of the dental product;

a second gear feeder for supplying the second gear of the dental product;
a second gear transfer mechanism for moving the second gear from the second gear feeder and locating it in the body of the dental product;
a tool feeder for supplying the tool of the dental product;
a tool transfer mechanism for moving the tool and attaching it to the dental product;
and

an assembled dental product transfer mechanism for transferring an assembled dental product from the moveable table.

8. The machine of Claim 7 further comprising a lubricator for lubricating the first and second gears of the dental angle.

9. The machine of Claim 7 further comprising sensors for detecting the presence of the body, the first and second gears, and the tool to ensure that the angle has been properly assembled.

10. The machine of Claim 9 further comprising an assembled product diverter for separating assembled angles having the body, first and second gears, and the tool from those assembled angles that are missing either the body, first and second gears, or the tool.

11. The machine of Claim 7 further comprising a first conveyor for automatically moving assembled angles to a bagging unit, the bagging unit automatically bagging the assembled angles.

12. The machine of Claim 11 further comprising a batch-counting unit for automatically counting a batch of assembled and bagged dental products and placing the batch in a container, and a second conveyor for moving assembled and bagged dental products from the bagging unit to the batch-counting unit.

13. The machine of Claim 12 further comprising a batch conveyor system comprising a first accumulating conveyor for supplying containers to the batch-counting unit and a second accumulating conveyor for moving a container with the batch to an unloading station.

14. The machine of Claim 13 further comprising a carton-sealing unit for sealing the container, the carton-sealing unit being located on the second accumulating conveyor and prior to the unloading station.

15. A machine for automating the assembly of a dental prophylaxis angle, the angle comprising a body, two gears, and a prophy cup, the machine comprising:
feeders for the body, the two gears, and the prophy cup;

transfer mechanisms for moving the body, the two gears, and the prophylaxis cup from the feeders to an assembly table and for assembling the body, the two gears, and the prophylaxis cup into an assembled dental prophylaxis angle;

sensors for distinguishing correctly assembled angles from incorrectly assembled angles;

an assembled angle diverter for diverting incorrectly assembled angles to a reject location and for diverting correctly assembled angles to a first conveyor;

a bagging unit for receiving correctly assembled angles from the first conveyor and automatically bagging the correctly assembled angles;

a second conveyor for moving bagged angles from the bagging unit;

a batch-counting unit for receiving the bagged angles and counting a batch, the batch comprising a predetermined number of angles and for placing the batch into one of a plurality of containers to form a filled container;

a first accumulating conveyor for supplying the plurality of containers to the batch-counting unit;

a second accumulating conveyor for moving the filled container from the batch-counting unit; and

a container sealer for sealing the filled container.

16. In a method of assembling a dental device with automated machinery, the dental device having a body and at least two gears, the body having a first end adapted to receive a drive mechanism for turning the gears of the dental device and a second end for holding a dental tool, the second end having a closure for closing off the second end of the dental product, a method for automatically closing the body of the dental device after the gears have been introduced into the body, the method comprising:

receiving the body of the angle with gears loaded into the body, the body being located on a mounting post that engages the first end of the dental device to hold it; and

closing the body of the dental device by using a mechanism that snaps the closure to a closed position to close off the second end of the angle.

17. The method of claim 16 wherein the step of closing the dental device further comprises engaging an outer surface of the closure and rotating it to the closed position.

18. A method of assembling a dental product, the dental product having a body, first and second gears, and a tool, the method comprising:

transferring the body of the dental device from a body feeder to a moveable table;

advancing the table to move the body to a first gear loading station and loading the first gear into the body;

advancing the table to move the body to a second gear loading station and loading the second gear into the body;

advancing the table to move the body to a closure station and closing the body of the dental device; and

advancing the table to move the body to a tool loading station and connecting the tool to the second gear of the dental device;

19. The method of claim 18 further comprising advancing the table to move the body to an inspection station, and inspecting the angle to determine whether it has been assembled properly.

20. The method of claim 19 further comprising diverting dental devices that have not been assembled properly to a rejection container and diverting dental devices that have been assembled properly to a conveyor to convey the properly assembled angles to a bagging station and conveying properly assembled angles on a conveyor to the bagging station and bagging the properly assembled angles.

21. The method of claim 18 further comprising lubricating the first and second gears of the dental device.

22. The method of claim 20 further comprising conveying the bagged dental devices to a batch-counting device, counting the bagged dental devices using the batch-counting device and creating a batch of dental devices comprising a selected number of dental devices.

23. The method of claim 22 further comprising loading the batch into a container and conveying the container to an unloading station.

24. The method of claim 23 further comprising sealing the container prior to conveying the container to the unloading station and then conveying the sealed container to the unloading station.

25. In a machine for assembling a dental prophylaxis angle, the dental angle comprising a body, having a first end adapted to receive a doriot hand piece drive mechanism and a second end having a closure member for closing the second end of the angle, and at least two gears, a plurality of identical fixtures for assembling the dental device, the fixtures comprising:

a base for mounting the fixture to a moveable table; and

a post mounted to the base for holding the body of the dental device, the post being sized to correspond to the doriot hand piece drive mechanism.

26. The fixtures of claim 25 wherein the post extends vertically upward from the base to hold the body in a vertically upward position.

27. The fixtures of claim 25 further comprising a closer device for engaging the closure member of the second end of the angle and moving it to a closed position in which the dental angle is closed.

28. The fixtures of claim 27 wherein the closer mechanism is sized to engage the closure member of the body and is coupled to an actuator linkage that is moveable between open and closed positions such that when the actuator linkage is activated it moves the closer mechanism to engage the closure member and moves the closure member to a closed position.

29. In a machine for assembling a dental device, the dental device comprising a body and first and second gears, the machine comprising:

- a movable table;

- a plurality of fixtures located on the movable table for holding the body of the dental device during phases of assembly;

- a plurality of stations that perform steps of assembly of the dental device in sequence with the movable table;

- a body feeder for supplying the body to a body isolator, the body isolator isolating a single body from the body feeder, and a body pick-and-place unit for moving the isolated body from the body isolator to one of the fixtures;

- a first gear feeder for supplying the first gear to a first gear isolator, the first gear isolator isolating a single first gear from the first gear feeder, and a first gear pick-and-place unit for moving the isolated first gear from the first gear isolator to one of the fixtures on which a body is located; and

- a second gear feeder for supplying the second gear to a second gear isolator, the second gear isolator isolating a single second gear from the second gear feeder, and a second gear pick-and-place unit for moving the isolated second gear from the second gear isolator to one of the fixtures on which a body and first gear are located.

30. The machine of claim 29 wherein the dental device also comprises a tool and the machine further comprising a tool feeder for supplying the tool to a tool isolator, the tool isolator isolating a single tool from the tool feeder, and a tool pick-and-place unit for moving the isolated tool from the tool isolator and placing it on the second gear.